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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,876	07/20/2004	Christian Walsdorff	53257	6620

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EXAMINER

DANG, THUAN D

ART UNIT	PAPER NUMBER
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1764

DATE MAILED: 04/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/501,876

Applicant(s)

WALSDORFF ET AL.

Examiner

Thuan D. Dang

Art Unit

1764

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 March 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 8, 9 is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 7 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 should be recited as a further step from claim 1 not a different process which producing ethylbenzene or styrene.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harris Dutcher (2,438,041) in view of Adams et al (3,161,670).

Harris discloses that butadiene can be dimerized to produce 4-vinylcyclohexene which can be further converted to styrene col. 2, lines 1-44). Similarly, applicants admitted in the specification on page 1, lines 8-12.

Harris does not disclose how the butadiene is derived. In other words, Harris does not disclose using a butadiene feed which is produced from butane (entire patent for details). However, Adams discloses a butadiene which is produced via steps similarly as called for in claim 4 (col. 2, lines 1-6; col. 3, line 27 thru col. 5, line 42. Note that step of reactions in the Adams do not arrive at the completion. Therefore, there are the presence of unreacted reactants such as butane and cofed-steam in the effluents.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the Harris process by using the butadiene produced by Adams to arrive at the applicants' claimed process since it is expected that using any butadiene feed would yield similar results.

Art Unit: 1764

It is noted that the product of the dehydrogenation step of Adams does not contain acetylenically unsaturated hydrocarbons and allenes (see entire patent for details). Therefore, the partial hydrogenation of said stream before the dimerization step is unnecessary.

Harris does not disclose using LPG as a source of butane as called for in claim 2. However, it is known that LPG contains butane and others (page 3, lines 21-25 of the specification).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the Harris process by using LPG as the source of butane since the industrial LPG contains about 10 wt% of butanes.

Of course, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the Harris process by removing any others than butane before the production of butadiene such as propane, isobutane to concentrating butane which is the main reactant for dehydrogenation.

Regarding claims 3 and 5, according to the disclosure on page 7, line 17-26, the Adams et al process appears to be similar as the autothermal dehydrogenation process since the Adams process need the oxygen and the exit product contains hydrogen (see the drawing).

Regarding claim 6, water and hydrogen are separated from the product of dehydrogenation (the drawing).

Response to Arguments

Applicant's arguments filed 3/13/06 have been fully considered but they are not persuasive.

Art Unit: 1764

The argument that acetylenes interfere in the butadiene dimerization, and acetylenes must be removed from the butadiene derived from the cracker is not persuasive since this argument is not related anything to the obviousness for using the Adams butadiene source for the Dutcher dimerization step. The Dutcher dimerization step employs butadiene to produce 4-vinylcyclohexene. Therefore, it is non-sense to say butadiene produced by Adams cannot be dimerized in the Dutcher process.

The argument that Dutcher relates to a process in which butadiene is employed rather than a product stream which contains butadiene as one of the constituents, one skilled in the art cannot reasonably consider all butadiene streams to be equally suited to serve as butadiene starting feed in the process of Dutcher is not persuasive since applicants also do not claim a process having no any step of removing anything different than butadiene. Actually, in step c of the claimed invention, applicants claim removing components other than butadiene such as water and other secondary components.

Adams does not suggest that the butadiene product meets the purity requirement for production of 4-vinylcyclohexene is not persuasive since as discussed above, Dutcher is the reference teaching using butadiene not Adams.

Allowable Subject Matter

Claims 8 and 9 are allowed.

The following is an examiner's statement of reasons for allowance: the prior art of record does not disclose or render obvious a process, as called for in claims 8, for producing styrene in which n-butane and 4-vinylcyclohexene are jointly dehydrogenated in a

Art Unit: 1764

dehydrogenation zone to produce a product containing styrene, butadiene, . . . After separated from styrene, butadiene and others is fed to a dimerization zone in which butadiene is dimerized to produce a product stream containing 4-vinylcyclohexene. 4-vinylcyclohexene is then fed to the dehydrogenation zone.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thuan D. Dang whose telephone number is 571-272-1445. The examiner can normally be reached on Mon-Thu.

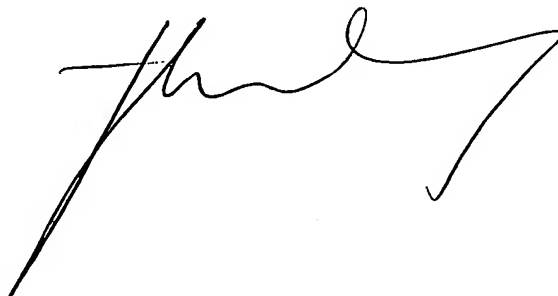
Art Unit: 1764

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thuan D. Dang
Primary Examiner
Art Unit 1764

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A handwritten signature in black ink, appearing to read 'Thuan D. Dang', with a stylized, sweeping flourish extending from the end of the name.